

AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior listings and versions of claims in this application.

1. (Currently Amended) A method for reducing roughness on a free surface of a semiconductor wafer which comprises implanting atoms under a face of a donor substrate to form a zone of weakness, bonding a stiffening substrate to the face, detaching the donor substrate along the zone of weakness to form the wafer including the stiffening substrate and a useful layer having the free surface, and applying a rapid thermal annealing process under a pure argon atmosphere for a time sufficient to uniformly heat and smooth the free surface of the wafer.

2. (Cancelled)

3. (Original) The method of claim 1 which further comprises rapid thermal annealing at a high temperature dwell in the range of about 1000°C to 1400°C, for a period in the range of about 1 second to 60 seconds.

4. (Original) The method of claim 3, wherein the high temperature dwell is in the range of about 1100°C to 1250°C, for a period in the range of about 5 seconds to 30 seconds.

5. (Currently Amended) The method of claim 1 which further comprises polishing the free surface of the wafer after the rapid thermal annealing.

6. (Original) The method of claim 1 which further comprises implementing at least one sacrificial oxidation stage to reduce slip lines in the free surface of the wafer.

7. (Original) ~~The method of claim 6~~ A method for reducing roughness on a free surface of a semiconductor wafer which comprises conducting at least one sacrificial oxidation stage on the free surface of the wafer to reduce slip lines therein and applying a rapid thermal annealing process under a pure argon atmosphere for a time sufficient to uniformly heat and smooth the free surface of the wafer; wherein the sacrificial oxidation

stage is conducted prior to or after the rapid thermal annealing, or both prior to and after the rapid thermal annealing.

8. (Currently Amended) The method of claim [[6]] 7, wherein the sacrificial oxidation stage is conducted after the rapid thermal annealing.

9. (Currently Amended) The method of claim [[6]] 7, wherein a first sacrificial oxidation stage is conducted prior to the rapid thermal annealing, and a second sacrificial oxidation stage is conducted after the rapid thermal annealing.

10. (Original) The method of claim 9 which further comprises conducting a polishing stage after the rapid thermal annealing and prior to the second sacrificial oxidation stage to further enhance free surface smoothness.

11. (Currently Amended) The method of claim [[6]] 7, wherein the rapid thermal annealing is followed by a first sacrificial oxidation stage, a polishing stage and a second sacrificial oxidation stage to further enhance free surface smoothness after the rapid thermal annealing.

12. (Original) The method of claim 5 which further comprises another rapid thermal annealing stage under pure argon after polishing to further enhance free surface smoothness.

13. (Original) The method of claim 5, which further comprises conducting a first sacrificial oxidation stage prior to the polishing stage.

14. (Original) The method of claim 5, which further comprises conducting a second sacrificial oxidation stage after the polishing stage.

15. (Original) The method of claim 1 which further comprises forming a silicon-on-insulator structure having a free surface with enhanced smoothness.

Claims 16 to 20. (Cancelled)

21. (Currently Amended) A method for reducing roughness on a free surface of a semiconductor wafer which comprises:

applying a rapid thermal annealing process under a pure argon atmosphere for a time sufficient to uniformly heat and smooth the free surface of the wafer;

polishing the wafer; and

implementing at least one additional treatment step comprising (a) at least one sacrificial oxidation stage conducted prior to or after the rapid thermal annealing process, (b) a sacrificial oxidation stage conducted after polishing, or (3) a second rapid thermal annealing process after polishing to reduce any remaining surface defects and enhance smoothness.

22. (Cancelled)

23. (Currently Amended) The method of claim [[22]] 21, wherein the sacrificial oxidation stage is conducted after the rapid thermal annealing.

24. (Currently Amended) The method of claim [[22]] 21, wherein the sacrificial oxidation stage is conducted prior to the rapid thermal annealing.

25. (Currently Amended) The method of claim 21, wherein two sacrificial oxidation stages are conducted, including the at least one additional treatment step comprises a first sacrificial oxidation stage conducted prior to the rapid thermal annealing and a second sacrificial oxidation stage conducted after the rapid thermal annealing.

26. (Currently Amended) The method of claim 21, wherein the ~~at least one additional treatment step comprises conducting another~~ second rapid thermal annealing ~~[[stage]] process is conducted~~ under pure argon after polishing to further enhance free surface smoothness.

27. (New) The method of claim 21, wherein the sacrificial oxidation stage is conducted after polishing.

28. (New) The method of claim 7, wherein the sacrificial oxidation stage is conducted prior to the rapid thermal annealing.

29. (New) The method of claim 7 which further comprises implanting atoms under a face of a donor substrate to form a zone of weakness, bonding a stiffening substrate to the face, and detaching the donor substrate along the zone of weakness to form the wafer including the stiffening substrate and a useful layer having the free surface.

30. (New) The method of claim 6, wherein the sacrificial oxidation stage is conducted prior to or after the rapid thermal annealing, or both prior to and after the rapid thermal annealing.

31. (New) The method of claim 29, which further comprises conducting a polishing stage after the rapid thermal annealing and prior to a sacrificial oxidation stage to further enhance free surface smoothness.

32. (New) The method of claim 21 which further comprises implanting atoms under a face of a donor substrate to form a zone of weakness, bonding a stiffening substrate to the face, and detaching the donor substrate along the zone of weakness to form the wafer including the stiffening substrate and a useful layer having the free surface.

33. (New) A method for reducing roughness on a free surface of a semiconductor wafer which comprises:

applying a rapid thermal annealing process under a pure argon atmosphere for a time sufficient to uniformly heat and smooth the free surface of the wafer; and

implementing at least two additional treatment steps to reduce any remaining surface defects and enhance smoothness, wherein the additional treatment steps include:

- (a) a polishing step and at least one sacrificial oxidation stage;
- (b) two sacrificial oxidation stages;
- (c) a polishing step and another rapid thermal annealing stage; or
- (d) a sacrificial oxidation stage and another rapid thermal annealing stage.